PATENT ABSTRACTS OF JAPAN

(11)Publication number : 07-235324

(43)Date of publication of application : 05.09.1995

(51)Int.Cl. H01M 8/06
H01M 8/02
H01M 8/10

(21)Application number : 06-051225

(22)Date of filing : 23.02.1994

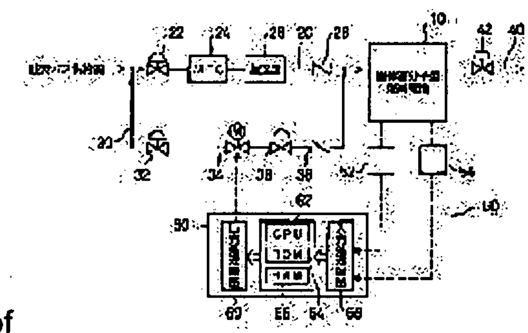
(71)Applicant : TOYOTA MOTOR CORP

(72)Inventor : KAWAZU NARIYUKI

(54) DRIVE DEVICE OF FUEL CELL

(57)Abstract:

PURPOSE: To generate continuous electromotive force effectively by performing the removal of the produced water from near the electrode with good responsiveness.



CONSTITUTION: The CPU 62 of an electronic control unit 60 senses excessive leak at the surface of the cathode of a solid highpolymer type fuel cell 10 from the output voltage E sensed by a voltmeter 52 and the impedance Z sensed by an impedance meter 54, and performs accordingly the control to enlarge the degree of opening of a motor-driven valve 34 provided in a bypass piping 30. Associated with the rate of flow in the bypass piping 30 is increased, and the rate of flow of the oxygen gas supplied to the cathode of the fuel cell 10 is increased. When the rate of flow of the oxygen gas is increased to V1, water drops coagulated at and attached to the surface of the cathode 120 of the fuel cell 10 are blown off by the dynamic pressure of the oxygen gas of the rate of flow V1 and passed through a gas exhaust piping 40 to be exhausted to the outside. Thereby thin holes at the surface of the cathode can be prevented from being choked with the water drops.

LEGAL STATUS

[Date of request for examination]	06.02.2001
[Date of sending the examiner's decision of rejection]	
[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]	
[Date of final disposal for application]	
[Patent number]	3509168
[Date of registration]	09.01.2004
[Number of appeal against examiner's decision of rejection]	
[Date of requesting appeal against examiner's decision of rejection]	
[Date of extinction of right]	

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the driving gear of the fuel cell which supplies gas to an electrode and acquires electromotive force from the chemical reaction of that distributed gas.
[0002]
[Description of the Prior Art] For example, as shown in a degree type, in an anode, the reaction for which the reaction which uses hydrogen gas as a hydrogen ion and an electron generates an electron to oxygen gas, a hydrogen ion, and water in a cathode is performed by the polymer electrolyte fuel cell which is one of the fuel cells.
anode: -- H2 ->2H++2e-cathode: -- 2H -- ++2e-+(1/2) O2 ->H2O [0003] In order to perform these reactions continuously, while supplying reacting matter to an electrode continuously, it is necessary to remove the quality of a product from near an electrode. In the case of a polymer electrolyte fuel cell, with a cathode, while supplying oxygen continuously, it is necessary to remove the water which is the quality of a product. It is because water will pile up near an electrode, and will blockade the pore of an electrode substrate, operation effectiveness will be reduced and a reaction will be stopped depending on the case, if the water of the quality of a product is not removed.
[0004] Conventionally, by eliminating the generation water near [such] an electrode, a hydrophobic part and the part of a hydrophilic property are prepared in an electrode by turns as a driving gear of the fuel cell which performs energy conversion continuously efficiently, and what discharges the water which absorbed water in the part of a hydrophilic property out of a fuel cell by the wick which made cotton fiber the shape of a string is proposed (JP,4-12462,A). Moreover, as equipment which does the same effectiveness so, the porous waterproof carbonic paper is formed between an electrolyte membrane and a cathode side gas passageway, and what discharges the moisture produced on the front face of the porous waterproof carbonic paper out of a fuel cell by the pressure of gas is proposed (JP,2-86071,A).
[0005]
[Problem(s) to be Solved by the Invention] However, with these equipments, from blowdown of water starting only after water fully permeates the inside of the waterproof carbonic paper or a wick, even if water became superfluous rapidly, water was not immediately able to be discharged. For this reason, as for the fuel cell, the lifting and the problem to which operation effectiveness falls temporarily produced loss of power. Moreover, these deck-watertight-luminaires carbonic paper and a wick had low thermal resistance, and the problem which degrades the endurance of a fuel cell was also produced.
[0006] The driving gear of the fuel cell of this invention was made in view of such a problem, and aims at acquiring electromotive force continuously efficiently by eliminating the generation water near an electrode with sufficient responsibility.
[0007]
[Means for Solving the Problem] The configuration shown below was taken as said The means for solving a technical problem that such an object should be attained.
[0008] Namely, the driving gear of the 1st fuel cell of this invention An electrode **** condition

detection means to supply gas to an electrode and to acquire electromotive force from the chemical reaction of the distributed gas and to be the driving gear of a fuel cell, and for said electrode to be damp and to detect a condition, When the condition too much that said electrode is damp with this electrode **** condition detection means is detected, it is making into the summary to have had the increment means in dynamic pressure to which the dynamic pressure of the distributed gas supplied to said electrode is made to increase temporarily.
[0009] In the driving gear of said 1st fuel cell, said increment means in dynamic pressure is good also as a configuration which has a circulation means to make said fuel cell circulate through a discharged part of said distributed gas from said fuel cell, and the circulating load adjustment device to which the circulating load of the gas by this circulation means is changed.
[0010] Said increment means in dynamic pressure is formed in the gas supply way which supplies said distributed gas to said fuel cell, or the gas exhaust passage which discharges said distributed gas from said fuel cell, and it may be constituted so that it may have a gas-pressure-adjusting means to adjust the gas pressure in this gas way.
[0011] Moreover, while having the humidifier which is formed in the driving gear of said 1st fuel cell all over the gas supply way which supplies distributed gas to said fuel cell, and this gas supply way, and humidifies said distributed gas, said increment means in dynamic pressure is good also as a configuration which has the bypass way which bypasses said gas supply way and supplies dry distributed gas to said fuel cell, and a bypass control-of-flow means control the flow rate of this bypass way.
[0012] On the other hand, the driving gear of the 2nd fuel cell of this invention An electrode **** condition detection means to be the driving gear of the fuel cell equipped with two or more cell units which are the aggregate of the cell which supplies gas to an electrode and acquires electromotive force from the chemical reaction of the distributed gas, and for said electrode to be damp and to detect a condition, When the condition too much that said electrode is damp to one of cell units with this electrode **** condition detection means is detected, it is making into the summary to have had the increment means in dynamic pressure to which the dynamic pressure of the distributed gas supplied to the electrode of the cell unit concerned is made to increase temporarily.
[0013] the means which shall be crossed to two or more cell units which contain at least the cell unit with which said increment means in dynamic pressure was equipped with said electrode with which passing gets wet for the object of the increment in the dynamic pressure of said distributed gas in the driving gear of said 1st fuel cell -- it comes out and is good also as a certain configuration.
[0014] Said increment means in dynamic pressure is good also as a configuration which has an activation timing decision means to perform the increment in the dynamic pressure of said distributed gas with time gap for every cell unit concerned, when the cell unit which increases dynamic pressure of said distributed gas covers plurality.
[0015] Furthermore, a gas-pressure-adjusting means for said increment means in dynamic pressure to be formed in the exhaust passage for every cell unit which discharges said distributed gas, respectively, and to adjust the gas pressure in this exhaust passage, When the condition too much that said electrode is damp to one of cell units with said electrode **** condition detection means is detected, While making the dynamic pressure of the distributed gas supplied to the electrode of the cell unit concerned by adjusting said gas-pressure-adjusting means corresponding to the cell unit concerned increase temporarily It is good also as a configuration which has the control means which decreases temporarily the dynamic pressure of the distributed gas supplied to the electrode of these cell unit by adjusting said gas-pressure-adjusting means corresponding to at least one of the cell units of others other than the cell unit concerned.
[0016] In the driving gear of said 1st or 2nd fuel cell, an electrode is good to consider as a cathode preferably. Furthermore, an electrode is good also as an anode and good also as both sides of a cathode and an anode.
[0017] Moreover, in the driving gear of said 1st or 2nd fuel cell, said fuel cell is good also as a configuration which is equipped with the slot which supplies gas to this electrode in contact with said

electrode surface, and gives the inner surface of this slot a water-repellent finish.
[0018]
[Function] If the condition too much that the electrode of a fuel cell is damp with an electrode **** condition detection means is detected according to the driving gear of a fuel cell according to claim 1, the dynamic pressure of the distributed gas supplied to an electrode will be temporarily increased by the increment means in distributed gas dynamic pressure. For this reason, the redundant water generated near the electrode by operation of a fuel cell is quickly blown away by said dynamic pressure which increased, and is discharged by the exterior of a fuel cell through the passage of distributed gas. Therefore, it prevents blockading the pore of an electrode substrate with the redundant water with sufficient responsibility.
[0019] According to the driving gear of a fuel cell according to claim 2, since supply to the fuel cell of distributed gas can be performed as a discharged part of the distributed gas from a fuel cell is also by the circulation means, economization of distributed gas is achieved.
[0020] According to the driving gear of a fuel cell according to claim 3, a configuration ends simply that what is necessary is just to form a gas-pressure-adjusting means in the gas supply way which supplies said distributed gas to a fuel cell, or the gas exhaust passage which discharges said distributed gas from said fuel cell.
[0021] According to the driving gear of a fuel cell according to claim 4, to a fuel cell, the distributed gas humidified with the humidifier is supplied through a gas supply way, and dry distributed gas is supplied through a bypass way. And by a bypass control-of-flow means being controlled, it increases and the thing of the dry capacity can be carried out. Consequently, since [according to / the dynamic pressure of the distributed gas which increased / which was mentioned above] it blows and that distributed gas that increased is conjointly dried with the effectiveness of ******, the redundant water generated near the electrode is eliminated with more sufficient responsibility.
[0022] If the condition too much that an electrode is damp in either of the cell units which are the aggregate of a cell with an electrode **** condition detection means is detected according to the driving gear of a fuel cell according to claim 5, the dynamic pressure of the distributed gas supplied to the electrode of the cell unit concerned will be temporarily increased by the increment means in distributed gas dynamic pressure. For this reason, also when it has two or more cell units, the redundant water generated near the electrode which changed into the condition too much of getting wet is quickly blown away with the dynamic pressure of that distributed gas that increased, and it prevents blockading the pore of an electrode substrate with that redundant water with sufficient responsibility.
[0023] According to the driving gear of a fuel cell according to claim 6, since it is not necessary to necessarily specify the electrode with which passing gets wet from covering two or more cell units which contain at least the cell unit equipped with the electrode with which passing gets wet the object of the increment in the dynamic pressure of distributed gas, the configuration of control ends simply.
[0024] According to the driving gear of a fuel cell according to claim 7, from having time gap for every cell unit, and the increment in the dynamic pressure of distributed gas being performed by the activation timing decision means, it will get wet and the increment in the output voltage accompanying recovery of a condition will be made little by little gradually.
[0025] According to the driving gear of a fuel cell according to claim 10, since the inner surface of the slot adjacent to an electrode surface is given a water-repellent finish, a slot cannot be easily covered with redundant water. For this reason, the redundant water of the electrode surface by the increment means blows away, and it will become easy from **.
[0026]
[Example] In order to clarify further a configuration and an operation of this invention explained above, the suitable example of this invention is explained below.
[0027] Drawing 1 is the plot plan of the fuel cell system 1 which applied the 1st example of the driving gear of the fuel cell of this invention. As shown in drawing 1 , this fuel cell system 1 is equipped with a polymer electrolyte fuel cell 10, the oxygen gas charging line 20 which sends the ingredient gas (oxygen or air) humidified by the polymer electrolyte fuel cell 10, the bypass piping 30 which bypasses that

oxygen gas charging line 20, the gas blowdown piping 40 which sends outside said ingredient gas discharged from a polymer electrolyte fuel cell 10, and the control system 50 which controls the flow rate of said bypass piping 30.

[0028] The configuration of a polymer electrolyte fuel cell 10 is explained below. Here, since it is easy, the case where the polymer electrolyte fuel cell 10 consists of cells (a cel is one thing) is explained first. Structural drawing of the polymer electrolyte fuel cell 10 with which drawing 2 consists of cells, and drawing 3 are the decomposition perspective views of the polymer electrolyte fuel cell 10. As shown in these drawings, the polymer electrolyte fuel cell 10 is constituted by the electrolyte membrane 110, the cathode 120 as a gas diffusion electrode and anode 130 which are made into sandwich structure on both sides of this electrolyte membrane 110 from both sides, the separator 140,150 which forms the passage of ingredient gas and fuel gas with a cathode 120 and an anode 130, inserting this sandwich structure from both sides, and the collecting electrode plate 160,170 which is arranged on the outside of a separator 140,150 and serves as a collector of a cathode 120 and an anode 130.

[0029] An electrolyte membrane 110 is the ion exchange membrane formed by polymeric materials, for example, fluororesin, and shows good electric conductivity according to a damp or wet condition. The cathode 120 and the anode 130 are formed of the carbon cross woven with the yarn which consists of a carbon fiber, and the carbon powder which supported the alloy which becomes this carbon cross from the platinum as a catalyst or platinum, and other metals is scoured in the clearance between crosses. The separator 140,150 is formed with the carbon plate of the quality of precise. The separator 140 by the side of a cathode 120 forms the oxygen gas passage (it is equivalent to the cathode side gas passageway mentioned above) 142 which makes the catchment way of the water generated with a cathode 120 while making the passage of the oxygen content gas which is ingredient gas on the front face of a cathode 120. Moreover, the separator 150 by the side of an anode 130 forms the hydrogen gas passageway 152 which makes the passage of the mixed gas of the hydrogen gas and the steam which are fuel gas on the front face of an anode 130. The collecting electrode plate 160 is formed with copper (Cu).

[0030] What was explained above is the fundamental configuration of a polymer electrolyte fuel cell 10. Next, the polymer electrolyte fuel cell 10 used actually is explained. Drawing 4 is structural drawing having shown the actual outline structure of a polymer electrolyte fuel cell 10. In addition, to the components of the same configuration as drawing 2 and drawing 3 , the same sign as drawing 2 and drawing 3 was attached among drawing 4 .

[0031] As shown in drawing 4 , on both sides of the cell 200 which consists of the electrolyte membrane 110, the cathode 120, and anode 130 which were shown by drawing 2 and drawing 3 , two or more laminatings of the polymer electrolyte fuel cell 10 are carried out with a separator 210. This separator 210 consists of the same ingredient as the separator 140,150 of the cell shown by drawing 2 and drawing 3 , forms the oxygen gas passage 142 on the front face of the cathode 120 of the cell 200 of one side, and forms the hydrogen gas passageway 152 on the front face of anode side 130 of the cell 200 of the other side. In addition, the separator 140 which forms only the oxygen gas passage 142 in the outside of cell 200R located most in right-hand side is arranged among drawing, and the separator 150 which forms only the hydrogen gas passageway 152 in the outside of cell 200L located most in left-hand side is arranged.

[0032] Furthermore, a polymer electrolyte fuel cell 10 equips the pan of the cooling water passage 220,230 arranged on the outside of these separators 140,150, and the cooling water passage 220,230 with the collecting electrode plate 160,170 arranged outside and the end plate 260,270 which sandwiches these whole through an electric insulating plate 240,250 from both sides, and is equipped with the clamping bolt 280 which binds an end plate 260,270 tight from an outside further.

[0033] Return, the oxygen gas charging line 20, the bypass piping 30, and the gas blowdown piping 40 are explained to drawing 1 below. The oxygen gas charging line 20 is a duct which supplies oxygen gas to the oxygen gas passage 142 of a polymer electrolyte fuel cell 10, and results [from an oxygen gas supply source] in the manifold (not shown) of the inlet side of a polymer electrolyte fuel cell 10. In the middle of the oxygen gas charging line 20, the 1st gas pressure regulating valve 22, MFC (Mass Flow Controller)24, humidifier 26, and check valve 28 are prepared sequentially from the source side of gas

supply.
[0034] The gas pressure regulating valve 22 is the thing of a diaphragm type, and a flow rate can be uniformly adjusted by operating it to a predetermined opening beforehand. MFC24 controls the mass flow rate of gas automatically to arbitration according to the flow rate setpoint signal given from the external controller which does not detect and illustrate the mass flow rate of gas. A humidifier 26 humidifies the gas which flows the oxygen gas charging line 20. The thing common bubbler type is adopted as this humidifier 26, and it has structure which puts in distributed gas in the tank in which water was stored, and adds a steam in gas. With such a humidifier 26, it is difficult to make the amount of humidification change suddenly, and when there is a demand which supplies a dry gas to a fuel cell 10, oxygen gas is supplied from the bypass piping 30 side.
[0035] By the configuration of such an oxygen gas charging line 20, the oxygen gas supplied from the source of gas supply is adjusted to a predetermined flow rate by the 1st gas pressure regulating valve 22 and MFC24, and is sent to the oxygen gas passage 142 of a polymer electrolyte fuel cell 10.
[0036] The bypass piping 30 is a duct from the upstream of the 1st gas pressure regulating valve 22 to [bypasses the oxygen gas charging line 20, sends the oxygen gas (dry gas) sent from the oxygen gas supply source to a polymer electrolyte fuel cell 10, and] the downstream of a check valve 28. In the middle of this bypass piping 30, the 2nd gas pressure regulating valve 32, a motor-operated valve 34, the 2nd gas pressure regulating valve 36, and a check valve 38 are formed sequentially from the upstream. A motor-operated valve 34 controls a flow rate to arbitration according to the bypass opening signal given from the control system 50. The flow rate which bypasses the oxygen gas charging line 20 by the configuration of such bypass piping 30 is controlled by the control system 50.
[0037] The gas blowdown piping 40 is a duct which sends outside the oxygen gas discharged from the oxygen gas passage 142 of a polymer electrolyte fuel cell 10. In addition, in the middle of the gas blowdown piping 40, it has the gas pressure regulating valve 42, and is adjusted by the magnitude which defined the pressure of the gas blowdown piping 40 beforehand with this gas pressure regulating valve 42.
[0038] A control system 50 is explained below. A control system 50 is equipped with the voltmeter 52 which detects the output voltage E of a polymer electrolyte fuel cell 10, and the impedance meter 54 which detects the impedance Z of a polymer electrolyte fuel cell 10 as a sensor which detects the condition of a polymer electrolyte fuel cell 10, and is further equipped with the electronic control unit 60 connected to a voltmeter 52 and an impedance meter 54.
[0039] A voltmeter 52 is the usual direct-current-voltage meter. An impedance meter 54 is an inter-electrode ohm-meter of alternating current system, as the electrochemical reaction of a polymer electrolyte fuel cell 10 is not affected. In addition, the test frequency of the alternating current in this impedance meter 54 has turned into the optimal frequency [kHz], 10 [for example,].
[0040] An electronic control unit 60 is constituted as a logical circuit centering on a microcomputer. In detail Although various data processing is performed by CPU62 and CPU62 which perform a predetermined operation etc. according to the control program set up beforehand ROM64 in which a required control program, required control data, etc. were stored beforehand, and although various data processing is similarly performed by CPU62 It has the input-process circuit 68 where various required data input the output signal from RAM66 written temporarily, a voltmeter 52, and an impedance meter 54, and the output-processing circuit which outputs by-pass rate setpoint signal to motor-operated valve 34 according to the result of an operation in CPU62 69 grade.
[0041] The cathode 120 of a polymer electrolyte fuel cell 10 is damp from the output signal from a voltmeter 52 and an impedance meter 54, a condition is judged, actuation control of the motor-operated valve 34 is carried out by CPU62 of the electronic control unit 60 of such a configuration according to this judgment result, and the flow rate of the oxygen gas supplied to a polymer electrolyte fuel cell 10 is controlled by it.
[0042] Next, the amount supply control processing of oxygen gas performed by CPU62 of an electronic control unit 60 is explained based on drawing 5 . CPU62 will read first the output voltage E detected with the voltmeter 52, and the impedance Z detected with the impedance meter 54, respectively, if

processing is started (steps S300 and S310). Subsequently, processing which the front face of the cathode 120 of a polymer electrolyte fuel cell 10 gets wet from these output voltage E and an impedance Z, and judges **** is performed (step S320). it progresses to step S330 noting that a cathode 120 is damp too much and comes out, when distinction of the 1st in detail with output voltage E smaller than the 1st predetermined electrical-potential-difference value E1 defined beforehand and distinction of the 2nd with an impedance Z smaller than the predetermined impedance value Z1 defined beforehand are performed and the affirmation judging of both the distinction of both is carried out.

[0043] At step S330, processing which sets the opening theta which defines the by-pass rate setpoint signal sent to a motor-operated valve 34 as predetermined opening thetac is performed. This predetermined opening thetac is a bigger value than the initial value theta 0 (for example, theta0=0[**]) at the time of this routine starting, consequently the quantity of the opening theta of a motor-operated valve 34 will be increased by thetac. When judged with a cathode 120 being damp too much and not coming out at step S320 on the other hand (i.e., when the negative judging at least of one side of said the 1st and 2nd distinction is carried out), it progresses to step S300, and processing after step S300 is repeated and performed.

[0044] If loading of the opening theta of a motor-operated valve 34 is made at step S330, processing which judges whether the front face of a cathode 120 got wet and **** was canceled after that will be performed (step S340). When it returns to the impedance value Z0 at the time of the normal operation out of which the impedance Z which the output voltage E detected with the voltmeter 52 became larger than the 2nd predetermined electrical-potential-difference value E2 (however, E2>E1) defined beforehand in detail, and was detected with the impedance meter 54 gets wet too much, and does not come, it judges with having been canceled that the front face of a cathode 120 gets wet too much. It waits for processing to repeat step S340 and to perform, to get wet and to cancel **** at step S340, if judged with not being canceled getting wet too much. If judged with the front face of a cathode 120 having got wet and on the other hand **** having been canceled, it will progress to step S350. At step S350, the opening theta which defines a by-pass rate setpoint signal is set as a initial value theta 0, and processing which returns the opening theta of a motor-operated valve 34 to an initial position is performed. Then, it escapes to "END" and this processing is ended.

[0045] In this way, by the constituted amount supply control processing of oxygen gas, the flow rate V of the oxygen gas which flows the impedance Z detected with the output voltage E detected with a voltmeter 52 and an impedance meter 54 and the oxygen gas charging line 20 explains below how it changes using the timing chart of drawing 6 with the passage of time.

[0046] Now, a polymer electrolyte fuel cell 10 shall be in an all seems well, and shall output output voltage E0 (time amount t0). The impedance at this time is Z0, and the flow rate V of the flowing oxygen gas presupposes that it is the oxygen gas charging line 20 V0. If it will be in the condition too much that the front face of the cathode 120 of a polymer electrolyte fuel cell 10 gets wet for a certain reason from this condition, the output voltage E of a polymer electrolyte fuel cell 10 will decline gradually, and an impedance Z will fall gradually. And if output voltage E is less than the predetermined electrical potential difference E1 and an impedance Z is less from the 1st predetermined impedance value Z1 (time amount t1), an affirmation judging will be carried out at step S320, it will progress to step S330, and the quantity of the opening theta of a motor-operated valve 34 will be increased by predetermined opening thetac. Consequently, only the specified quantity is increased and the flow rate V of the oxygen gas of the oxygen gas charging line 20 is set to V1 from V0.

[0047] If the flow rate of oxygen gas is increased to V1, the waterdrop (redundant water) which solidified and adhered on the front face of the cathode 120 of a polymer electrolyte fuel cell 10 will be blown away by the dynamic pressure of the oxygen gas of the flow rate V1, and will be discharged outside through the gas blowdown piping 40. For this reason, it can prevent the pore on the front face of a cathode being blockaded by waterdrop, and the cathode part which was not able to contribute to electrochemical reaction by that waterdrop will also begin electrochemical reaction. Therefore, the output voltage E of a polymer electrolyte fuel cell 10 begins lifting from E1. Moreover, since the waterdrop adhering to the front face of a cathode 120 is blown away by the dynamic pressure of oxygen

gas as mentioned above, it escapes from the condition too much that a cathode 120 is damp, consequently an impedance Z begins lifting from Z1.

[0048] Then, if output voltage E and an impedance Z continue rising and it exceeds E2 and E0, respectively (time amount t2), it will judge that the front face of the cathode 120 of a polymer electrolyte fuel cell 10 got wet, and returned from the condition to normal, and the opening theta of a motor-operated valve 34 will be returned to a initial value theta 0 by step S350. Consequently, the flow rate V of the oxygen gas which flows the oxygen gas charging line 20 returns from V1 to V0 of a basis. In addition, in this example, although said E2 is large from the output voltage E0 in a steady state, this is because oxygen gas is supplied to the polymer electrolyte fuel cell 10 also from the bypass piping 30 in addition to the oxygen gas charging line 20, and the magnitude of E2 changes with the capacity passed for the bypass piping 30.

[0049] As explained in full detail above, the fuel cell system 1 of this 1st example can blow away quickly the waterdrop adhering to the front face of a cathode 120 as it is also at the flow rate of the oxygen gas the quantity of was increased. For this reason, the generation water of the front face of a cathode 120 can be eliminated with sufficient responsibility, therefore electromotive force can be efficiently acquired from a polymer electrolyte fuel cell 10 continuously. especially the oxygen gas that increased in this example in order to blow away waterdrop since the humidifier was not formed in the bypass piping 30 -- drying -- **** -- this sake -- said -- it can blow and generation water can be conjointly eliminated with still more sufficient responsibility with the effectiveness of ******. Therefore, much more efficient continuous electromotive force can be acquired from a polymer electrolyte fuel cell 10. System-wide endurance seems moreover, not to use a heat-resistant low ingredient like the conventional example, for this reason not to deteriorate, since this fuel cell system 1 blows away waterdrop with the dynamic pressure of oxygen gas.

[0050] In addition, although the motor-operated valve 34 and the gas pressure regulating valve 36 were formed in the bypass piping 30 in said 1st example, as it changes to this and is shown in drawing 7 , it is good also as a configuration which controls the mass flow rate of the oxygen gas which forms MFC380 in the bypass piping 30, and flows the bypass piping 30 by MFC380. By such configuration, the same effectiveness as the 1st example can be done so. In addition, to the components of the same configuration as drawing 1 , the same sign was attached among drawing 7 .

[0051] Next, the 2nd example of this invention is explained. Drawing 8 is the plot plan of the fuel cell system 400 which applied the 2nd example of the driving gear of the fuel cell of this invention. As shown in drawing 8 , this fuel cell system 400 is equipped with the polymer electrolyte fuel cell 10, the oxygen gas charging line 20, and the gas blowdown piping 40 of the same configuration as the 1st example, changes them to the bypass piping 30 of the 1st example, and forms the gas circulation piping 430. In addition, this fuel cell system 400 is equipped also with the same control system 50 as the 1st example, and adjusts the gas circulating load of the gas circulation piping 430 with the electronic control unit 60 prepared in the control system 450. In addition, to the components of the same configuration as drawing 1 , the same sign was attached among drawing 8 .

[0052] The gas circulation piping 430 is a duct which circulates oxygen gas toward connection section 20a of the check valve 28 and polymer electrolyte fuel cell 10 in the oxygen gas charging line 20 from connection section 40a of the polymer electrolyte fuel cell 10 and the gas pressure regulating valve 42 in the gas blowdown piping 40. In the middle of the gas circulation piping 430, the blower fan 432 for circulation and the check valve 434 are formed sequentially from the connection section 40a side. The blower fan 432 for circulation embraces the control signal given from the electronic control unit 60, and operates / stops a fan. A check valve 434 protects that gas circulates for the gas circulation piping 430 from the oxygen gas charging line 20 side.

[0053] Next, the amount supply control processing of oxygen gas performed by CPU62 of an electronic control unit 60 is explained based on drawing 9 . The amount supply control processing of oxygen gas in this 2nd example As compared with it in the 1st example, steps S300-S320 of the 1st example and the respectively same content as S340 are processed about steps S500-S520 and S540. While performing processing which changes to step S330 and carries out the start up of the blower fan 432 for circulation

(step S530), processing which changes to step S350 and suspends the blower fan 432 for circulation is performed (step S550).

[0054] In this way, according to the constituted amount supply control processing of oxygen gas, the cathode front face of a polymer electrolyte fuel cell 10 gets wet from the output voltage E detected with the voltmeter 52, and the impedance Z detected with the impedance meter 54, **** is detected, and the start up of the blower fan 432 for circulation is carried out at the time of the detection. Operation of the blower fan 432 for circulation increases the flow rate of the oxygen gas with which only the quantity of the specified quantity which becomes settled according to the driving ability of the blower fan 432 for circulation is increased, consequently the amount of oxygen gas which circulates through the gas circulation piping 430 flows the oxygen gas passage 142 of a polymer electrolyte fuel cell 10 by that loading. For this reason, the waterdrop adhering to the front face of a cathode 120 can be quickly blown away with the dynamic pressure of the oxygen gas of that flow rate. Therefore, like the 1st example, the generation water of the cathode 120 neighborhood can be eliminated with sufficient responsibility, and electromotive force can be efficiently acquired from a polymer electrolyte fuel cell 10 continuously. Moreover, the effectiveness of preventing degradation of system-wide endurance as well as the 1st example does so.

[0055] Furthermore, in this 2nd example, in spite of doing so effectiveness which was mentioned above, consumption of distributed gas can be held down by making a polymer electrolyte fuel cell 10 circulate through the oxygen gas discharged from the oxygen gas passage 142.

[0056] In addition, although the flow rate which circulates through the gas circulation piping 430 by operating / stopping the blower fan 432 for circulation is changed in said 2nd example, it changes to this, and after considering as the condition made it always operate, the blower fan 432 for circulation may consist of carrying out adjustable [of the rotational speed of the blower fan 432 for circulation] so that the amount of circulating flow of the gas circulation piping 430 may be changed.

[0057] Next, the 3rd example of this invention is explained. Drawing 10 is the plot plan of the fuel cell system 600 which applied the 3rd example of the driving gear of the fuel cell of this invention. As shown in drawing 10 , after this fuel cell system 600 loses the bypass piping 30 as compared with the 1st example, the point of having formed the electromotive back pressure regulating valve 642 in the gas blowdown piping 640 is different. In addition, to the components of the same configuration as drawing 1 , the same sign was attached among drawing 10 .

[0058] The electromotive back pressure regulating valve 642 controls an opening to arbitration according to the opening signal given from the electronic control unit 60 of a control system 50, and adjusts the gas pressure in the gas blowdown piping 640. If the opening of the electromotive back pressure regulating valve 642 increases, the rate of flow of the oxygen gas which the gas pressure of the gas blowdown piping 640 declines, consequently flows the oxygen gas passage 142 of a polymer electrolyte fuel cell 10 will become large rapidly. That is, it becomes possible by changing the opening of the electromotive back pressure regulating valve 642 to change the rate of flow of oxygen gas.

[0059] Next, the amount supply control processing of oxygen gas performed by CPU62 of an electronic control unit 60 is explained along with the flow chart of drawing 11 . First, like steps S300-S320 of the 1st example, cathode 120 front face of a polymer electrolyte fuel cell 10 gets wet, and the amount supply control processing of oxygen gas in this 3rd example detects **** (steps S700-S720).

[0060] Then, the processing which only the predetermined opening alpha will control [processing] the electromotive back pressure regulating valve 642 in the open direction, and will reduce gas pressure P of the gas blowdown piping 640 to P1 (however, $P<P0$) from the pressure P0 at the time of normal operation if it gets wet and **** is detected is performed (step S730). Then, processing which judges whether cathode 120 front face got wet and **** was canceled is performed (step S740). When it returns to the impedance value Z0 at the time of the normal operation out of which the impedance Z which output voltage E became larger than the 3rd predetermined electrical-potential-difference value E3 (however, $E0>E3>E1$) defined beforehand in detail, and was detected with the impedance meter 54 gets wet too much, and does not come, it judges with having been canceled that the front face of a cathode 120 gets wet too much. Processing which it gets [processing] wet, it waits [processing] the to

be judged with **** having been canceled, and the electromotive back pressure regulating valve 642 is controlled [processing] by step S730 in the close direction, and returns gas pressure P to the pressure P0 at the time of normal operation at step S740 is performed (step S750). Then, this processing is ended.

[0061] In this way, the constituted amount supply control processing of oxygen gas showed how gas pressure P of output voltage E, an impedance Z, and the gas blowdown piping 40 would change with the passage of time to the timing chart of drawing 12 .
[0062] Now, a polymer electrolyte fuel cell 10 shall be in an all seems well, and output voltage E shall output E0 (time amount t0). The impedance Z at this time is Z0. The pressure P of the oxygen gas of the gas blowdown piping 640 is P0 by adjusting the electromotive back pressure regulating valve 642. If it will be in the condition too much that the front face of the cathode 120 of a polymer electrolyte fuel cell 10 gets wet from this condition, the output voltage E of a polymer electrolyte fuel cell 10 will decline gradually, and an impedance Z will fall gradually. And if output voltage E is less than the predetermined electrical potential difference E1 and an impedance Z is less than the 1st predetermined impedance value Z1 (time amount t11), gas pressure P will fall to P1 by controlling the electromotive back pressure regulating valve 642 by step S730.
[0063] If gas pressure P of the gas blowdown piping 640 falls to P1, output voltage E will once decline from the property of the polymer electrolyte fuel cell 10 referred to as depending for output voltage E on gas pressure P. Moreover, if lowering of that gas pressure P is received, differential pressure with the entrance side of a polymer electrolyte fuel cell 10 will become large for a moment, for this reason the rate of flow of the oxygen gas which flows the oxygen gas passage 142 will become large rapidly. Consequently, the waterdrop adhering to the front face of a cathode 120 is blown away by that rate of flow, and output voltage E increases and begins lifting as it is in lowering of that output voltage E not much for the same reason as the 1st example (time amount t12). In addition, an impedance Z begins lifting promptly from time amount t11.
[0064] Then, if output voltage E and an impedance Z continue rising, and output voltage E exceeds E3 and an impedance Z reaches the impedance value Z0 at the time of normal operation (time amount t13), the front face of the cathode 120 of a polymer electrolyte fuel cell 10 will get wet, will judge that it returned from the condition to normal, and will return a pressure P to the pressure P0 at the time of normal operation by controlling the electromotive back pressure regulating valve 642 by step S750.
[0065] In this way, according to the constituted amount supply control processing of oxygen gas, the cathode front face of a polymer electrolyte fuel cell 10 gets wet from the output voltage E detected with the voltmeter 52, and the impedance Z detected with the impedance meter 54, **** is detected, and gas pressure P by the side of the gas blowdown piping 640 is reduced at the time of the detection. If the gas pressure P falls, the rate of flow of the gas which flows the oxygen gas passage 142 of a polymer electrolyte fuel cell 10 will become large rapidly. For this reason, it can blow away quickly that it is also at the rate of flow of that oxygen gas about the waterdrop adhering to the front face of a cathode 120. Therefore, electromotive force can be efficiently acquired from a polymer electrolyte fuel cell 10 continuously like the 1st and 2nd examples. Moreover, the effectiveness of preventing degradation of system-wide endurance as well as the 1st and 2nd examples does so.
[0066] Furthermore, in this 3rd example, since the rate of flow of the oxygen gas which flows the oxygen gas passage 142 is controllable only by forming the electromotive back pressure regulating valve 642 in the gas blowdown piping 640, the effectiveness that a configuration ends simply also does so.
[0067] In addition, it may change to this, and although the electromotive back pressure regulating valve 642 was formed in the gas blowdown piping 40, as shown in drawing 13 , you may constitute from said 3rd example so that the electromotive back pressure regulating valve 642 may be formed in the oxygen gas charging line 20. That is, as shown in drawing 13 , the electromotive back pressure regulating valve 642 is formed on it between the humidifiers 26 and check valves 28 in the oxygen gas charging line 20 as a configuration which formed the gas pressure regulating valve 42 in the gas blowdown piping 40 like the 1st example. Such a configuration enables it to change the rate of flow of the oxygen gas passage

142 of a polymer electrolyte fuel cell 10 by adjusting the gas pressure of the oxygen gas charging line 20 by the electromotive back pressure regulating valve 642. Therefore, the same effectiveness as the 1st thru/or the 3rd example can be done so.
[0068] Next, the 4th example of this invention is explained. Drawing 14 is the plot plan of the fuel cell system 800 which applied the 4th example of the driving gear of the fuel cell of this invention. As shown in drawing 14 , this fuel cell system 800 uses together the configuration of the 3rd example shown by the configuration and drawing 10 of the 1st example shown by drawing 1 . That is, while having the polymer electrolyte fuel cell 10 of the same configuration as the 1st example, the oxygen gas charging line 20, and the bypass piping 30, it has the gas blowdown piping 640 which has the electromotive back pressure regulating valve 642 of the same configuration as the 3rd example. In addition, to the components of the same configuration as drawing 1 , the same sign was attached among drawing 14 .
[0069] In this way, when according to the 4th constituted example the cathode front face of a polymer electrolyte fuel cell 10 gets wet and **** is detected, while opening a motor-operated valve 34 and making the gas supply by the bypass piping 30 start, gas pressure P by the side of the gas blowdown piping 640 is reduced by the electromotive back pressure regulating valve 642. Consequently, while oxygen gas is supplied through the bypass piping 30 in addition to the oxygen gas charging line 20, oxygen gas is inhaled by the polymer electrolyte fuel cell 10 in response to lowering of gas pressure P by the side of the gas blowdown piping 640. Therefore, both effectiveness is added and it is quickly increased by the flow rate of the oxygen gas which flows the oxygen gas passage 142 of a polymer electrolyte fuel cell 10 as a result.
[0070] From such a thing, the waterdrop adhering to the front face of the cathode 120 of a polymer electrolyte fuel cell 10 can be blown away much more certainly. For this reason, the generation water of the cathode 120 neighborhood can be eliminated with much more sufficient responsibility, and electromotive force can be more efficiently acquired from a polymer electrolyte fuel cell 10 continuously.
[0071] Next, the 5th example of this invention is explained. Drawing 15 is the plot plan of the fuel cell system 900 which applied the 5th example of the driving gear of the fuel cell of this invention. As shown in drawing 15 , as compared with the 1st example, a point equipped with two or more polymer electrolyte fuel cells 910 (this unit is hereafter called a cell unit) which are the aggregate of two or more cells is greatly different, and this fuel cell system 900 is fundamentally in agreement about the point that loading of supply of oxygen gas is in drawing using the bypass piping 930.
[0072] As shown in drawing 15 , namely, this fuel cell system 900 The n cell units 910-1,910-2,910-3 from the 1st to the n-th (n is the positive number of arbitration), --, 910-n, The oxygen gas charging line 920 which sends oxygen gas to each cell unit 910-1 - 910-n, It has the bypass piping 930 which bypasses the oxygen gas charging line 920, the gas blowdown piping 940 which sends outside the oxygen gas discharged from each cell unit 910-1 - 910-n, and the control system 950 which controls the flow rate and its distribution place of said bypass piping 930.
[0073] the oxygen gas charging line 920 -- the order from an oxygen gas supply source -- the 1st gas pressure regulating valve 922, 1st MFC924, and humidifier 926 -- having -- **** -- the downstream -- every -- it has branched toward the 1st thru/or n-th cell unit 910-1 - 910-n. In addition, in the middle of each interconnecting tube from the branch point to each cell unit 910-1 - 910-n, the check valve 928-1,928-2,928-3 and -- which forbid the return of the oxygen gas to the direction of an oxygen gas supply source, and 928-n are prepared, respectively.
[0074] The bypass piping 930 is equipped with the 2nd gas pressure regulating valve 932, 2nd MFC934, and passage switcher 936 sequentially from the oxygen gas supply source. the bypass piping 930 of the downstream of the passage switcher 936 -- every -- it has branched in the direction which goes to the 1st thru/or n-th cell unit 910-1 - 910-n, and it is changed selectively whether it becomes in the direction in which the passage of oxygen gas goes to which cell unit 910-1 - 910-n by the passage switcher 936. In addition, in the middle of each interconnecting tube from the passage switcher 936 to each cell unit 910-1 - 910-n, the check valve 938-1,938-2,938-3 and -- which forbid the return of the oxygen gas to the

direction of an oxygen gas supply source, and 938-n are prepared, respectively.
[0075] the gas blowdown piping 940 -- every -- the configuration which brought together the fork road from the 1st thru/or n-th cell unit 910-1 - 910-n in one is carried out, and the gas pressure regulating valve 942 is arranged in the set part for a check valve 944-1,944-2, --, 944-n by each fork road part, respectively.
[0076] It has the control system 950 centering on the electronic control unit 960 like the 1st example. Further as a sensor The voltmeter 952 which detects output voltage [of the 1st thru/or n-th cell unit 910-1 - 910-n] E (1) - E (n) according to an individual, respectively, every -- it has the impedance meter 954 which detects impedance [of the 1st thru/or n-th cell unit 910-1 - 910-n] Z (1) - Z (n) according to an individual, respectively.
[0077] CPU962 of an electronic control unit 960 performs the next processing, performing an exchange of ROM964, RAM966, and data. Namely, the cathode of each cell unit 910-1 - 910-n is damp from impedance Z (1) detected with output voltage E (1) detected with the voltmeter 952 - E (n), and an impedance meter 954 - Z (n), and an electronic control unit 960 judges a condition. According to this judgment result, MFC934 and the passage switcher 936 are controlled, and processing which increases the quantity of the flow rate of the oxygen gas to the cell unit 910-1 in the condition too much of getting wet - 910-n is performed.
[0078] The amount supply control processing of oxygen gas performed by CPU962 is explained based on drawing 16 . output voltage [of each cell unit 910-1 - 910-n by which CPU962 was first detected with the voltmeter 952 when processing was started] E (1) -- or (E (n) is read (step S1000).) Subsequently, impedance [of each cell unit 910-1 detected with the impedance meter 954 - 910-n] Z (1) thru/or Z (n) are read (steps S1000 and S1010). Then, Variable i is set to initial value 0 (step S1020), and processing for which only a value 1 increments this variable i is performed (step S1030).
[0079] Then, it judges whether it is in the condition too much that the i-th cathode of cell unit 910-i based on Variable i is damp (step S1040). This judgment is that thing that gets wet and judges **** based on output voltage E (i) detected from the voltmeter 952 and the impedance meter 654, and impedance Z (i). In detail The distinction of the 1st with output voltage E (i) smaller than the 1st predetermined electrical-potential-difference value E1 defined beforehand, it progresses to step S1050 noting that the i-th cathode of cell unit 910-i is damp too much and comes out, when distinction of the 2nd smaller than the predetermined impedance value Z1 as which impedance Z (i) was determined beforehand is performed and the affirmation judging of both the distinction of both is carried out.
[0080] The passage switcher 936 is controlled by step S1050, and processing which changes the passage of the bypass piping 930 in the direction which goes to i-th cell unit 910-i is performed at it. Subsequently, processing which sets the bulb opening theta which defines the by-pass rate setpoint signal sent to MFC934 as predetermined opening thetac is performed (step S1060). This predetermined opening thetac is a bigger value than the initial value theta 0 (for example, theta0=0[**]) at the time of this routine starting, consequently the quantity of the bulb opening theta of MFC934 will be increased by thetac. When judged with the i-th cathode of cell unit 910-i being damp too much, and not coming out at step S1040 on the other hand (i.e., when the negative judging at least of one side of said the 1st and 2nd distinction is carried out), it progresses to step S1030, and processing after step S1030 is repeated and performed.
[0081] If loading of the bulb opening theta of MFC934 is made at step S1060, processing which judges whether the front face of a cathode got wet and **** was canceled after that will be performed (step S1070). When it returns to the impedance value Z0 at the time of the normal operation out of which the impedance Z which output voltage E (i) became larger than the 2nd predetermined electrical-potential-difference value E2 (however, E2>E1) defined beforehand in detail, and was detected with the impedance meter 54 gets wet too much, and does not come, it judges with having been canceled that the front face of a cathode gets wet too much. It waits for processing to repeat step S1070 and to perform, to get wet and to cancel **** at step S1070, if judged with not being canceled getting wet too much. If judged with the cathode front face having got wet and on the other hand **** having been canceled, it will progress to step S1080. At step S1080, the opening theta which defines a by-pass rate setpoint

signal is set as a initial value theta 0, and processing which returns the bulb opening theta of MFC934 to an initial position is performed.

[0082] Then, it judges whether Variable i is larger than the constant n which shows the number of the cell unit 910-1 - 910-n (step S1090). Here, if a negative judging is carried out, only a value 1 will increment return and Variable i to step S1030, and it will process after step 1030 to the following cell unit 910. On the other hand, if an affirmation judging is carried out at step S1090, it will escape from it to "END" and Variable i will end this control processing noting that it reaches a constant n.

[0083] According to the amount supply control processing of oxygen gas constituted as mentioned above, if the cell unit 910 which has a cathode front face in getting wet too much out of the n cell unit 910-1 - 910-n is detected, by controlling MFC934 and the passage switcher 936, CPU962 will change the passage of the bypass piping 930 toward the cell unit 910 in the condition too much of getting wet, and will increase the flow rate. For this reason, since the flow rate of the oxygen gas supplied to the cell unit 910 in that condition too much of getting wet is increased, it can blow away that it is also at the flow rate of that oxygen gas the quantity of was increased about the waterdrop adhering to the cathode front face of that cell unit 910, and that condition too much of getting wet can be recovered with sufficient responsibility. Therefore, electromotive force can be efficiently acquired continuously also to any of two or more cell units 910-1 - 910-n.

[0084] in addition -- this 5th example -- every -- when it judges that two or more cell units 910 are in the condition too much that a cathode is damp out of the 1st thru/or n-th cell unit 910-1 - 910-n, said recovery which gets wet is processed with time gap in order for each [it is in that condition too much of getting wet] cell unit of every. For this reason, if each cell unit 910-1 - 910-n will be in the condition too much of getting wet, every one of the **** of that is recoverable. Therefore, as the whole fuel cell which is the set of the n-th cell unit 910-1 - 1st [**] thru/or 910-n, output voltage accompanying the recovery in which each cell unit 910-1 - 910-n get wet can be increased little by little gradually, and the rapid increment in output voltage can be controlled.

[0085] Next, the 6th example of this invention is explained. It is going to circulate this 6th example to a supply-oxygen gas discharged from fuel cell like 2nd example mentioned above after constituting fuel cell from two or more cell units like 5th example side.

[0086] Drawing 17 is the plot plan of the fuel cell system 1900 which applied the 6th example of the driving gear of the fuel cell of this invention. As shown in drawing 17 , this fuel cell system 1900 is equipped with the 1st thru/or the 4th cell unit 910-1 - 910-n, the oxygen gas charging line 920, and the gas blowdown piping 940 of the same configuration as the 5th example, changes them to the bypass piping 930 of the 5th example, and forms the gas circulation piping 1930. This fuel cell system 1900 is equipped also with the control system 950 of the same configuration as the 5th example, and adjusts the gas circulating load of the gas circulation piping 1930 with the electronic control unit 960 prepared in the control system 950. In addition, to the components of the same configuration as drawing 15 , the same sign was attached among drawing 17 .

[0087] the gas circulation piping 1930 -- branch point 940a of the gas blowdown piping 940 to oxygen gas -- taking out -- every -- it is the duct through which the n-th cell unit 910-1 - 1st [**] thru/or 910-n are made to circulate, respectively. In the middle of the gas circulation piping 1930, it has the blower fan 1934 for circulation, and the passage switcher 1936 sequentially from the branch point 940a side. In addition, from the passage switcher 1636, about the downstream, it has the same configuration as the 5th example, and omits about detailed explanation here. The blower fan 1934 for circulation embraces the control signal given from the electronic control unit 960, and operates / stops a fan.

[0088] Next, the amount supply control processing of oxygen gas performed by CPU962 of an electronic control unit 960 is explained based on drawing 18 . The amount supply control processing of oxygen gas in this 6th example About steps S2000-S2050, and S2070 and S2090, steps S1000-S1050 of the 5th example and the respectively same content as S1070 and S1090 are processed as compared with it in the 5th example. While performing processing which changes to step S1060 and carries out the start up of the blower fan 1934 for circulation (step S2060), processing which changes to step S1080 and suspends the blower fan 1934 for circulation is performed (step S2080).

[0089] In this way, if the cell unit 910 with which passing gets wet out of the 1st thru/or n-th cell unit 910-1 - 910-n is detected according to the constituted amount supply control processing of oxygen gas, while controlling the passage switcher 936, the quantity of the flow rate of the oxygen gas supplied toward the cell unit 910 in the condition too much of getting wet will be increased by carrying out the start up of the blower fan 1934 for circulation. Consequently, in the fuel cell system 1900 of this 6th example, electromotive force can be efficiently acquired continuously like the 5th example also to any of two or more cell units 910-1 - 910-n.
[0090] Next, the 7th example of this invention is explained. After constituting a fuel cell from two or more cell units like the 5th and 6th examples, like the 3rd example, this 7th example tends to prepare an electromotive back pressure regulating valve in gas blowdown piping of a fuel cell, and tends to change the rate of flow of the oxygen gas which flows on the cathode front face of a fuel cell by these electromotive back pressure regulating valves.
[0091] Drawing 19 is the plot plan of the fuel cell system 2900 which applied the 7th example of the driving gear of the fuel cell of this invention. As shown in drawing 19 , as compared with the 6th example, as for this fuel cell system 2900, the following point is different. First, after losing the gas circulation piping 1930, the 1st thru/or n-th electromotive back pressure regulating valve 2910-1, 2910-2, --, 2910-n were prepared in each fork road of the gas blowdown piping 940. And adjustment of these electromotive back pressure regulating valves 2910-1 - 2910-n was enabled with the electronic control unit 960 of a control system 950. Furthermore, it changed to the voltmeter 952 of the 5th and 6th example, and while forming the voltmeter 2952 which detects the total output voltage ET of the connected 1st thru/or the n-th cell unit 910-1 - 910-n, it changed to the impedance meter 2954, and the impedance meter 2954 which detects the total impedance ZT of the n-th cell unit 910-1 - 1st [**] thru/or 910-n was formed.
[0092] The amount supply control processing of oxygen gas performed by CPU962 of an electronic control unit 960 is explained along with the flow chart of drawing 20 . CPU962 will set Variable i to initial value 0 first, if processing is started (step S3000). Then, while reading the total output voltage ET of each cell unit 910-1 detected with the voltmeter 2952 - 910-n, the total impedance ZT of each cell unit 910-1 detected with the impedance meter 954 - 910-n is read (steps S3010 and S3020).
[0093] Then, processing which judges whether it is in the condition too much that at least one or more cell units are damp based on the total output voltage ET detected from the voltmeter 952 and the impedance meter 654 and the total impedance ZT in the 1st thru/or n-th cell unit 910-1 - 910-n is performed (step S3030). It progresses to step S3040 noting that it is in the condition too much that one of cell units is damp, when distinction of the 1st in detail with the total output voltage ET smaller than the 1st predetermined electrical-potential-difference value ET 1 defined beforehand and distinction of the 2nd with the total impedance ZT smaller than the predetermined impedance value ZT1 defined beforehand are performed and the affirmation judging of both the distinction of both is carried out.
[0094] At step S3040, processing for which only a value 1 increments Variable i is performed. Then, only the predetermined opening alpha controls i-th electromotive back-pressure-regulating-valve 2910-i based on Variable i in the open direction, and processing the gas pressure Pi of the attachment part of the electromotive back-pressure-regulating-valve 2910-i of the gas blowdown piping 640 concerned is reduced [processing] to Pb from the pressure Pa at the time of normal operation is performed (step S3050).
[0095] Then, only the predetermined opening alpha will control i-th electromotive back-pressure-regulating-valve 2910-i based on Variable i in the close direction, and CPU962 will perform processing which returns the gas pressure Pi of the attachment part of the electromotive back-pressure-regulating-valve 2910-i of the gas blowdown piping 640 concerned to the pressure Pa at the time of normal operation, if delay processing by which only predetermined time is delayed is performed (step S3060) and the time delay passes (step S3070).
[0096] Then, if Variable i judges whether it is larger than the constant n which shows the number of the cell unit 910-1 - 910-n (step S3080) and a negative judging is carried out, the processing after return and step S3030 will be repeated to step S3030, and will be performed to it. On the other hand, if an

affirmation judging is carried out at step S3080, it will escape from it to "END" and Variable i will end this control processing noting that it reaches a constant n. Moreover, when a negative judging is carried out at step S3030 (i.e., also when judged with it not being in the condition too much that which cell unit 910-1 - 910-n also get wet), it escapes to "END" and control processing is ended.
[0097] According to the constituted amount supply control processing of oxygen gas, in this way, CPU962 It judges whether there is any thing in the condition too much of getting wet in the 1st thru/or n-th cell unit 910-1 - 910-n from the total output voltage ET and the total impedance ZT. If judged with it being in the condition too much that one of the cell units 910-1 - 910-n get wet First, only predetermined time performs processing to which the 1st electromotive back pressure regulating valve 2910-1 is adjusted and the gas pressure P1 of the attachment part of the electromotive back pressure regulating valve 2910-1 is reduced [processing] to Pb (after predetermined time progress returns gas pressure P1 to Pa). If the gas pressure P1 declines, the rate of flow of the oxygen gas which flows the oxygen gas passage of the cell unit 910-1 established in the upstream of the electromotive back pressure regulating valve 2910-1 will become large rapidly. for this reason, when the cell cell unit in the condition too much of getting wet is the 1st cell unit 910-1 concerned, it is blown away quickly that the waterdrop adhering to the cathode front face of that cell unit 910-1 is also at the rate of flow of that oxygen gas, and that cell unit 910-1 is the optimal -- it gets wet and will be in a condition.
[0098] then, the 2nd electromotive back pressure regulating valve 2910-2 is adjusted similarly, and the optimal in the 2nd cell unit 910-2 -- it gets wet and considers as a condition. Then, processing is continued until it judges that all of an increase or the condition too much of carrying out and getting wet by step S3030 were canceled by the processing object like the 3rd and the 4th. the cell unit 910 which is in the condition too much of getting wet, by such configuration is altogether the optimal -- it gets wet, and considers as a condition and electromotive force can be efficiently acquired continuously like the 5th example and the 6th example also to any of two or more cell units 910-1 - 910-n.
[0099] Furthermore, in this 7th example, since what is necessary is just to be able to detect as total, without the 1st thru/or n-th cell unit 910-1 - 910-n getting wet, and detecting a condition according to an individual, the number of signals of the detection signal from a sensor can be lessened, and the effectiveness that the configuration of control processing can be cleared up easily also does so further.
[0100] Next, the modification of the 7th example of this invention is explained. This modification takes the configuration on the same hardware as the 7th example, and the content of the amount supply control processing of oxygen gas performed by CPU962 of an electronic control unit 960 is only different compared with the 7th example.
[0101] The amount supply control processing of oxygen gas performed by CPU962 of the electronic control unit 960 in this modification is explained along with the flow chart of drawing 21 . As compared with the control processing shown with the flow chart of drawing 20 , step S3055 is added immediately after step S3050, the point of having added step S3075 is different immediately after step S3070, and this amount supply control processing of oxygen gas is the same about others.
[0102] When it gets wet at step S3030 and is judged with **** in this amount supply control processing of oxygen gas, it is step S3050. Only the predetermined opening alpha controls i-th electromotive back-pressure-regulating-valve 2910-i based on Variable i in the open direction. After reducing the gas pressure Pi of the attachment part of the electromotive back-pressure-regulating-valve 2910-i of the gas blowdown piping 640 concerned to Pb from the pressure Pa at the time of normal operation, the following step S3055 is processed. Only the predetermined opening beta (<<alpha) controls the electromotive back pressure regulating valve 2910-1 to 2910-i-1 of others except said i-th electromotive back-pressure-regulating-valve 2910-i, and 2910-i+1 - 2910-n by step S3055 in the close direction, respectively. being concerned -- electromotive -- back-pressure-regulating-valve 2910-1-2910 - i-1, gas pressure P1-Pi-1 of the attachment parts of 2910-i+1 - 2910-n, and Pi+1-Pn -- every [a small amount] -- processing raised, respectively is performed.
[0103] Moreover, after only the predetermined opening's alpha controlling i-th electromotive back-pressure-regulating-valve 2910-i based on Variable i in the close direction and returning the gas pressure Pi of the attachment part of the electromotive back-pressure-regulating-valve 2910-i of the gas

blowdown piping 640 concerned to the pressure Pa at the time of normal operation at step S3070, the following step S3075 is processed. Only the predetermined opening beta controls the electromotive back pressure regulating valve 2910-1 to 2910-i-1 of others except said i-th electromotive back-pressure-regulating-valve 2910-i, and 2910-i+1 - 2910-n by step S3075 in the open direction, respectively. Gas pressure P1-Pi-1 of the electromotive back pressure regulating valve 2910-1 to 2910-i-1 concerned and the attachment parts of 2910-i+1 - 2910-n and processing to which Pi+1-Pn is returned to the pressure Pa at the time of normal operation are performed.

[0104] While doing so the effectiveness that electromotive force can be efficiently acquired continuously also to any of two or more cell units 910-1 - 910-n as well as the 7th example according to the modification of such 7th example, the following effectiveness also does so.

[0105] Drawing 22 is a timing chart which shows change of the total output voltage ET in this modification. As shown in drawing 22 , by time amount t21, it is operated normally and each cell unit 910-1 - 910-n presuppose that the total output voltage ET is in the predetermined electrical potential difference ET 0. If it will be in the condition too much that the cathode front face of one of the cell units 910-1 - 910-n gets wet from this condition, the total output voltage ET will decline rapidly. The amount supply control processing of oxygen gas by CPU962 is performed, and if lowering of the back pressure is achieved to the cell unit 910 too much with which the beginning gets wet, the total output voltage ET will rise gradually (time amount t22-t23). Then, the total output voltage ET rises for a while with the control which returns the back pressure to an initial position (time amount t23-t24). Subsequently, the same processing as the cell unit 910 of the 2nd henceforth with which passing gets wet is performed, and the total output voltage ET returns to the magnitude at the time of normal operation gradually.

[0106] In time amount t22-t23, as mentioned above, reducing the gas pressure of the gas blowdown piping part of the cell unit 910 with which passing gets wet using an electromotive back pressure regulating valve is planned, but as the 3rd example explained, and output voltage ET is shown in an alternate long and short dash line among drawing in response to the failure of pressure from the property of the fuel cell referred to as depending for output voltage on gas pressure, it should once fall. on the other hand -- this modification -- step S3055 -- other electromotive back pressure regulating valves -- adjusting -- the gas pressure of the attachment part of the electromotive back pressure regulating valve concerned -- every [a small amount] -- by making it go up, respectively, lowering of that total output voltage ET can be suppressed, and fluctuation of the output voltage at the time of a return is controlled, and smooth return processing is attained. For this reason, it is efficient much more and electromotive force can be acquired.

[0107] In addition, although the amount supply control processing of oxygen gas mentioned above in the set of all the cell units 910-1 from the 1st to the n-th - 910-n has been performed in said 7th example and its modification It is good also as a configuration which performs the amount supply control processing of oxygen gas which changed to this, divided the 1st thru/or n-th cell unit 910-1 - 910-n into some sets, and was mentioned above in these set units. That is, total output voltage and a total impedance are detected per these sets, it gets wet from these detection result, and **** is detected, and the dynamic pressure of the oxygen gas supplied to each cell unit within the limits of these set unit is constituted so that it may increase in order. The same effectiveness as these examples can be done so also by such configuration.

[0108] It consisted of each example mentioned above so that the dynamic pressure of the oxygen gas supplied to a cathode might be increased, but it may change to this, and you may constitute so that it may increase by control with the same said of the dynamic pressure of the hydrogen gas supplied to an anode in addition to the increment in the oxygen gas to the cathode. By such configuration, electromotive force can be continuously acquired from the ability of lock out of the pore to be prevented also about the electrode substrate by the side of an anode much more efficiently. In addition, control of the increment in dynamic pressure may not be performed about a cathode side, but you may constitute so that only the dynamic pressure of the hydrogen gas supplied to an anode may be increased.

[0109] Furthermore, you may make it take the next configuration in each example mentioned above. Drawing 23 is the partial perspective view of the separator 140 which constitutes the oxygen gas passage

142 with a cathode front face, and drawing 24 is an A-A line sectional view in drawing 23 . As shown in both drawings, the Teflon layer 4000 is formed in the inner surface of slot 142a of the rectangle which constitutes the oxygen gas passage 142. This Teflon layer 4000 was formed as follows, and it means that a water-repellent finish was given.

[0110] A resist is beforehand applied to the part which touches a cathode 120 directly among the front faces of a separator 140. Next, the separator 140 whole is made immersed in the dispersion (Daikin Industries Pori Flon D-1) of polytetrafluoroethylene (it is the same as polytetrafluoroethylene and PTFE (Teflon)), or dispersion is blown. Then, it is made to dry for a while at a room temperature, and the solvent component in dispersion (generally water, an alcohols solvent, or both partially aromatic solvent) is evaporated. Next, it is made to dry from 30 minutes at 100 degrees C among air for 1 hour, and the moisture of dispersion is volatilized thoroughly. Furthermore, it heats at 250-300 degrees C among nitrogen-gas-atmosphere mind or argon atmosphere for 2 to 3 hours, and polytetrafluoroethylene is calcinated. Thus, the layer of Teflon is formed in the front face of a separator 140.

[0111] Next, chemicals (resist remover) remove the resist beforehand applied at the previous process. The resist remover used here changes with classes of resist, and if both do not affect the formation process of a hydrophobic layer using the PTFE dispersion described previously, a user should just choose both a resist and a resist remover as arbitration from the ease of carrying out of the processing of used waste fluid by the ease of carrying out of chemical cost or handling etc.

[0112] Due to such a configuration, since the inner surface of slot 142a is given a water-repellent finish by the Teflon layer 4000, redundant water cannot collect on slot 142a easily. For this reason, the redundant water on the front face of a cathode mentioned above blows away, it will become easy from **, and electromotive force can be acquired continuously much more efficiently.

[0113] In addition, in said example, the Teflon layer 4000 may be formed as follows. Although the resist is beforehand applied to the part which touches a cathode 120 directly among the front faces of a separator 140 and dispersion was made immersed in said example, change to this, and the whole front face of a separator 140 is made immersed in dispersion as it is, or you may make it blow dispersion. Then, the same processing as said example is performed, and the layer of Teflon is formed in the whole front face of a separator 140. Then, the part which touches a cathode 120 directly among the front faces of a separator 140 is ground or cut mechanically, and the Teflon layer of the part is removed. In this way, you may constitute so that the Teflon layer 4000 may be formed.

[0114] Moreover, although the Teflon layer 4000 was formed in the oxygen gas passage 142 formed in a separator 140 in said example, it is good also as a configuration which prepares the same Teflon layer as the hydrogen gas passageway 152 which changes to this and is formed in a separator 150. By such configuration, the redundant water on the front face of an anode can blow, and ****** can be made easier. Moreover, it can be good also as a configuration which prepares the both sides of the oxygen gas passage 142 and the hydrogen gas passageway 152 a Teflon layer, the redundant water on a cathode front face and the front face of an anode can blow, ****** can be made easy, and electromotive force can be acquired continuously much more efficiently.

[0115] In each example mentioned above, although the ingredient gas supplied to a cathode 120 was made into oxygen, it is changed to this and is good also as air. Since the need capacity when passing the amount of the same currents becomes large compared with the time of considering as oxygen when it considers as air, also in possibility that superfluous water will arrive at an electrode surface, the direction of air becomes large. Therefore, the effectiveness of this invention will be demonstrated more for the direction at the time of making ingredient gas into air.

[0116] Although the example of this invention was explained above, as for this invention, it is needless to say that it can carry out in the mode which becomes various within limits which are not limited to such an example at all and do not deviate from the summary of this invention.

[0117]

[Effect of the Invention] Since the dynamic pressure of the distributed gas supplied to an electrode will be temporarily increased if the condition too much that the electrode of a fuel cell is damp is detected in the driving gear of the 1st fuel cell of this invention as explained above, the redundant water generated

near the electrode by operation of a fuel cell is quickly blown away by said dynamic pressure which increased, and is discharged by the exterior of a fuel cell. For this reason, it can prevent blockading the pore of an electrode substrate with that redundant water with sufficient responsibility, therefore the effectiveness that electromotive force can be efficiently acquired from a fuel cell continuously is done so. Moreover, in the driving gear of this fuel cell, since redundant water is blown away with the dynamic pressure of distributed gas, the effectiveness to prevent also does so that it is not necessary to use a heat-resistant low ingredient like the conventional example, for this reason system-wide endurance deteriorates.

[0118] Furthermore, in the driving gear of this fuel cell, the secondary effectiveness that it is the fuel cell of low cost more in a smaller fuel cell, and a further more lightweight fuel cell can realize predetermined electrical energy is done so from the ability of electromotive force to be efficiently acquired from a fuel cell, as mentioned above. Moreover, since the electromotive force stabilized continuously can be acquired from a fuel cell as mentioned above, the secondary effectiveness that the current supply only in the fuel cell becomes easy also does so, without using together with other power sources, such as a general source power supply.

[0119] If the condition too much that an electrode is damp in the driving gear of the 2nd fuel cell of this invention on the other hand in either of the cell units which are the aggregate of a cell is detected, since the dynamic pressure of the distributed gas supplied to the electrode of the cell unit concerned will be increased temporarily, also when it has two or more cell units, the redundant water generated near the electrode which changed into the condition too much of getting wet is quickly blown away by the dynamic pressure of the distributed gas which increased. For this reason, it can prevent blockading the pore of an electrode substrate with that redundant water with sufficient responsibility, and electromotive force can be efficiently acquired continuously also to any of two or more cell units.

[Translation done.]